Autism Spectrum Disorder (ASD) affects one in 68 people in the US. We propose a quantitative and objective ASD diagnostic tool based on eye tracking and deep neural networks (DNNs). The diagnostic process is completely data-driven and assumption-free.

Subjects freely observe a selection of natural-scene images, with eye movements recorded. Discriminative features are extracted from a deep neural network of visual attention and integrated to predict the subjects’ ASD risk.

- **Subjects**: 20 high-functioning adults with ASD and 19 healthy controls.
- **Stimuli**: 700 natural-scene images.
- **Task**: passive image viewing for 3 seconds.

**Contributions**
- The first DNN-based model for ASD diagnosis, demonstrating superior performance.
- Generalizable to other neurodevelopmental disorders.
- Reducing the amount of data and time required.
- Enriching understanding of the atypical attention in ASD.

**Image Selection**
- Select the most discriminative images based on the Fisher scores of gaze features.
- Compute a DoF map to indicate the difference of eye fixations between subjects with ASD and controls.

**Results**

<table>
<thead>
<tr>
<th>Image Selection</th>
<th>No. of Images</th>
<th>Acc.</th>
<th>Sens.</th>
<th>Spec.</th>
<th>AUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaze</td>
<td>700</td>
<td>0.81</td>
<td>0.83</td>
<td>0.79</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.86</td>
<td>0.93</td>
<td>0.79</td>
<td>0.88</td>
</tr>
<tr>
<td>VGG-16</td>
<td>700</td>
<td>0.85</td>
<td>0.83</td>
<td>0.87</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.83</td>
<td>0.83</td>
<td>0.84</td>
<td>0.85</td>
</tr>
<tr>
<td>VGG-16 (fine-tuned)</td>
<td>700</td>
<td>0.85</td>
<td>0.83</td>
<td>0.87</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.92</td>
<td>0.93</td>
<td>0.92</td>
<td>0.92</td>
</tr>
</tbody>
</table>

**Comparison**

- Falkner et al. [12]
  - CARS: 0.81, 0.82, 0.80
  - ADOS: 0.82, 0.87, 0.78
  - ASD-DC: 0.84, 0.88, 0.81

- Liu et al. [22]
  - ET: 0.89, 0.93, 0.86, 0.89

- Ours
  - ET: 0.92, 0.93, 0.92, 0.92